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NOTES, ABSTRACTS, AND REVIEWS

G. C. Simpson on the distribution of terrestrial radiation (**1**)—*Radiation balance.*—According to the author, "The difference between the intensity of the terrestrial radiation (R) and of the effective solar radiation (S) represents the rate of accumulation or loss of heat due to radiation. This is a very important meteorological factor, for on it depends nearly every process which takes place in the atmosphere."

The outgoing terrestrial radiation (R).—Again the author states, "It will be sufficient to recall (**2**) that the outgoing radiation depends on four factors only, namely, (a) the surface temperature, (b) the temperature of the upper surface of the clouds, (c) the temperature of the stratosphere, and (d) the amount of cloud. Given the values of these four factors, the intensity of outgoing radiation is first calculated for clear skies, R_1; then for overcast skies, R_2; then the actual intensity of the outgoing radiation is given by

$$R = R_1\ (1 - C) + R_2 C,$$

in which C is the cloud amount expressed as a fraction of the sky covered by clouds."

For surface temperatures, and for cloud amounts, values for the months of January and July determined by Dr. C. E. P. Brooks for 10° squares between latitude 70° N. and 70° S. were employed. They are plotted in Figures 2 to 5 of the paper.

The temperature of the upper surface of the clouds was taken to be 269° A. in all parts of the world (**2**), and the temperature of the stratosphere was taken to be a simple function of the latitude as follows:

Latitude	0°–10°	10°–20°	20°–30°	30°–40°	40°–50°	50°–60°	60°–70°
Stratosphere temperature	204	207	211	214	217	219	220

The resulting values of R are charted on maps, Figures 6 and 7 of the paper. The author calls attention to the remarkable uniformity of the value of R on both maps. For both seasons and for practically the whole area represented the values fall between 0.26 and 0.30 cal. per min. per square centimeter. On both maps there are, however, relatively high values on each side of the Equator, while at the Equator the values differ but little from those in polar regions. This is accounted for by the low temperature of the stratosphere and the large amount of cloud in equatorial regions. Desert regions are the source of the most intense outgoing radiation.

The effective solar radiation (S).—This is the quantity of solar radiation absorbed by the earth and its atmosphere, and is computed from the equation.

$$S = S'\ (1 - a)$$

where S' is the intensity of the incoming solar radiation and a is the albedo of the earth and its atmosphere. For values of a the author had adopted the following, which are the means of those given by Aldrich (**3**) and Ångström (**4**).

Cloud amount	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
Albedo, a	0.17	0.22	0.27	0.32	0.37	0.43	0.48	0.54	0.61	0.67	0.74

Using for January and July values of a corresponding to the cloudiness for the different 10° squares, a value of the solar constant of 1.952, and relative values of radiation intensity for different latitudes at the limit of the atmosphere given by Angot (**5**), values of S were obtained. The differences, $S - R$ represent, as already stated in the first paragraph of this review, the rate of accumulation or loss of heat due to radiation, and are plotted in Figures 8 and 9 of the paper. In general, there is an accumulation of heat between latitudes 20° N. and 60° S. in January, and a loss between 20° and 70° N. In July there is an accumulation between latitudes 15° S. and nearly 70° N., with a loss between 15° and 70° S. There are, however, areas of maximum accumulation (in excess of 0.15 calories per minute per square centimeter) over South America, Africa, and Australia in January, and a belt of maximum accumulation of somewhat less intensity at latitude 30° N. in July. Also in July there are small areas of loss of radiation in the region of monsoon winds in India and in West Africa, due to the excessive cloudiness.

By a similar process, but using monthly mean values of temperature (**6**), (**7**), and cloudiness (**8**) for 10° zones of latitude instead of for 10° squares, and, further, taking into account the area of the different zones, the total effective solar (S) and terrestrial (R) radiation for each month have been computed for each zone and for the whole earth. The author calls attention to the symmetry of curves of net radiation ($S - R$) for the different seasons in the two hemispheres. There is, however, an excess for the whole earth in October to April, and a deficiency in May to September, on account of the varying distance of the earth from the sun.

For the whole year the outgoing terrestrial and the effective solar radiation should balance. The computed values of total terrestrial radiation exceed the computed values of the total effective solar radiation by 2 per cent, which is well within the percentage of accuracy of the values for the cloudiness and the albedo of the earth that were employed in the computations.

The author calls attention to the fact that "The whole of the summer hemisphere up to and beyond 60° is receiving more heat than it radiates." He therefore concludes that "There can be little flow of heat toward the north in July or toward the south in January. Similar conditions will be found to hold during the three months centering at the solstices, i. e., November to January and May to July."

The reviewer wishes to remark that if the different ways in which the effective radiation is expended are considered a latitudinal temperature difference in summer will be indicated. Thus, in high latitudes a considerable part of (S) is employed in melting the ice that has accumulated during the winter months, and is not available for raising the temperature of the earth's surface and of the air in the troposphere. Therefore, there are considerable differences in the temperature of the troposphere in high and in low latitudes during the summer months, although they are much less than in the winter months.

The new way in which radiation is treated in this paper will no doubt receive the careful consideration of meteorologists.

(**1**) Mem. R. Meteor. Soc. (London) 3, No. 23, 1929.
(**2**) Mem. R. Meteor. Soc. (London) 3, No. 21, 1928.
(**3**) Smithsonian Institution (Washington).
Ann. Astroph. Obs., 2:162, 1908.
Ann. Astroph. Obs., 4:379, 1922.
(**4**) Ångström, A. Beitr. Geophysik (Leipzig) 16, H. 1, 1926.
(**5**) Ann. bur. cent. Météor. (Paris), 1883, partie 1, pp. B136–161.
(**6**) Hoffner, Peterman's Geogr. Mitt. 1906, p. 33.
(**7**) Shaw, Sir Napier. Manual of Meteorology, Vol. II, 1928.
(**8**) Brooks, C. E. P. Mem. R. Meteor. Soc. (London) 1, No. 10, p. 129, 1927.

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